

Appl. No. 09/767,027
Amdt. dated December 24, 2003
Reply to Office Action of October 31, 2003

Amendments to the Specification:

Page 1, first full paragraph:

RELATED APPLICATIONS: This application claims priority to U.S. Provisional

B¹ Application Serial No. 60/081,388 filed April 10, 1998, incorporated herein by reference,
and is a continuation of ~~and~~ U.S. Patent Application Serial No. 09/201,464 filed
November 30, 1998, now U.S. Patent No. 6,200,289.

Page 7, last full paragraph:

B² Details of the drive mechanism 12 are seen in Figs. 2-5. Starting with Fig. 2,
drive mechanism 12 includes a housing 22 with a top surface 24 and intermediate
surface 26 disposed below top surface 24. On surface 26 there is formed a rail 28
extending along the longitudinal axis of housing ~~14~~ 22. A platform 30 which is disposed
on the rail 28 can be reciprocated back and forth in parallel with said longitudinal axis,
as described in more detail below.

Page 8, last full paragraph:

B³ Typically, the syringe 90 has a barrel 92 positioned in groove 36 so that its ~~finger~~
tab 95A (seen in Fig. 6) rests in slot 54. The syringe 90 also includes a plunger 94
reciprocated within the barrel 92 by a shaft 93. The shaft terminates in a finger pad 96.
When the syringe 90 is seated in groove 36, the finger pad 96 rests in slot ~~58~~ 56 of
platform 30. In this position, the syringe 90 is secured to the housing 22 by inserting

3
the legs 44 of clamp 40 into slot extensions 38 and advancing or sliding the clamp 40 to the left over the syringe 90 until it is positioned at the end of the syringe body 92 adjacent to the slot 54. In this position, the screw 50 is tightened, forcing the pad 52 to advance and engage the barrel of syringe 90. The groove 36 assists in the positioning of the syringe 90. The syringe terminates with a Luer lock 95 used to connect the syringe to tube 14.

Page 9, second full paragraph:

34
In the embodiment discussed so far, it is assumed that a fluid is dispensed from the syringe 90 and, therefore, this syringe 90 must be preloaded with said fluid either by the manufacturer, or must be filled at the site by the clinician or an assistant prior to the start of any operation. In many procedures, however it is more desirable to provide the fluid to be dispensed in a cartridge such as cartridge 100 shown in Fig. 8. As can be seen in this Figure, cartridge 100 consists of a cylindrical barrel 102. At one end, the barrel 102 is provided with a ~~plunger~~ piston 104 made of rubber or a similar resilient material which can be reciprocated through the barrel 102 to selectively eject the liquid contained therein. At the opposite end, the cartridge is provided with a seal formed of a membrane 106 which must be pierced before the contents of the cartridge can be dispensed.

Page 9 last full paragraph:

35
Fig. 9 shows an adapter 110 provided to allow the driver of Figs. 1-7 to dispense a fluid from cartridge 100. The adapter 110 includes a holder 112 adapted to hold cartridge 100. Holder 112 includes a first end having a connector 114 (for example a Luer connector) to connect the adapter 110 to delivery tube 14. Inside the holder 112, adjacent to connector 114, there is a spike 116 constructed and arranged to pierce the membrane 106 when the cartridge 100 is inserted into the holder 112. At the opposite end, the holder 112 is provided with radially extending projections 448 119 to secure the holder 112 to a drive mechanism 12. The cartridge holder 112 described so far is disclosed in commonly assigned copending application SN 09/028,009 filed February 23, 1998 entitled "Dental Anesthetic and Delivery Injection Unit" incorporated herein by reference .

Page 11, first full paragraph

36
Adapter 110 further includes a coupling element 118 formed of a shaft 120 terminating at one end with a barb or hook 121 and at the opposite end with a thumb pad 122. The shaft 120 passes through a cap 124 adapted to mount on holder 112 by projections 446 119 engaging corresponding depressions (not shown) in the cap 124. Cap 124 is provided with a tab 126 extending radially and having the approximate shape of finger tab 95A on a standard syringe 90.

Page 12, last paragraph:

37
Step 300 involves, first, having the clinician enter the following information: type of syringe being used, type (i.e. size and length) of tube 14, type of needle being used, and name or other identification of the fluid in the syringe. This information may be entered manually by the clinician using an input device such as a keyboard or a touch screen disposed in the screen. Alternatively, a plurality of the corresponding items (for example, syringes) may be retrieved and displayed from the data bases and then presented to the clinician. The clinician then uses a standard pointing device such as a mouse or a touch screen (generally identified by numeral 162 in Fig. 10) as a selector to select the appropriate syringe. Alternatively a voice command may be used for this selection. Fig. 12 A shows a typical screen for designating or selecting a syringe. As seen on this screen, once a syringe is selected or designated, its physical characteristics such as length, nominal volume, stroke length,, syringe force are retrieved from the data bank and displayed. After the needle and fluid have been designated, their characteristics are retrieved and displayed as well.

Page 21, last full paragraph:

38
Every time the microprocessor 152 checks the pressure (Step 318 in Fig. 11), it actually calculates the exit or needle pressure P_n as discussed above. Figs. 15 B and 16 B and ~~17B~~ show a normal pressure and an abnormal pressure curve respectively using these expressions.

Appl. No. 09/767,027
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Page 22, last full paragraph:

B9 If in step 602 it is determined that charging without is to be performed then in step ~~604~~ 614 the platform 30 is moved to the empty position of the syringe. The system then waits for the syringe to be placed in its position in step 616, after which the system continues with step 610 as shown.